

Monday

Algebra 2 Honors
Unit 1 Test – Functions REVIEW

Name:
Date:

I. Find the solution to this system of equations:

$$\begin{aligned} -5x + y &= 12 \\ -3(x - 2y) &= 4 \end{aligned}$$

$$\begin{aligned} y &= 12 + 5x \\ -3(x - 2(12 + 5x)) &= 4 \\ -3(x - 24 - 10x) &= 4 \\ -3(-9x - 24) &= 4 \\ 27x + 72 &= 4 \\ 27x &= -68 \end{aligned}$$

$$x = \frac{-68}{27}$$

$$y = 12 + 5\left(\frac{-68}{27}\right)$$

$$y = 12 - \frac{340}{27}$$

$$y = 12 - 12 \frac{16}{27}$$

$$y = -\frac{16}{27}$$

$$x = \frac{-68}{27} = -2 \frac{14}{27}$$

$$y = -\frac{16}{27}$$

2. Given these functions:

$$\text{ADD}(a, b) = a + b$$

$$\text{SUBTRACT}(a, b) = a - b$$

a) Find $\text{ADD}(7, 10)$

$$\text{ADD}(7, 10) = 7 + 10$$

$$\boxed{\text{ADD}(7, 10) = 17}$$

b) Find $\text{SUBTRACT}(2, -4)$

$$\text{SUBTRACT}(2, -4) = 2 - (-4)$$

$$\boxed{\text{SUBTRACT}(2, -4) = 6}$$

c) Is $\text{ADD}(2, \text{ADD}(x, -3)) = \text{ADD}(2x, -1)$?

$$\text{ADD}(2, \text{ADD}(x, -3)) \stackrel{?}{=} \text{ADD}(2x, -1)$$

$$\text{ADD}(2, x - 3) \stackrel{?}{=} 2x - 1$$

$$\boxed{x - 1 \neq 2x - 1 \quad \text{no}}$$

d) What is $\text{SUBTRACT}(b, \text{ADD}(b, -b))$?

$$\text{SUBTRACT}(b, \text{ADD}(b, -b))$$

$$\text{SUBTRACT}(b, 0)$$

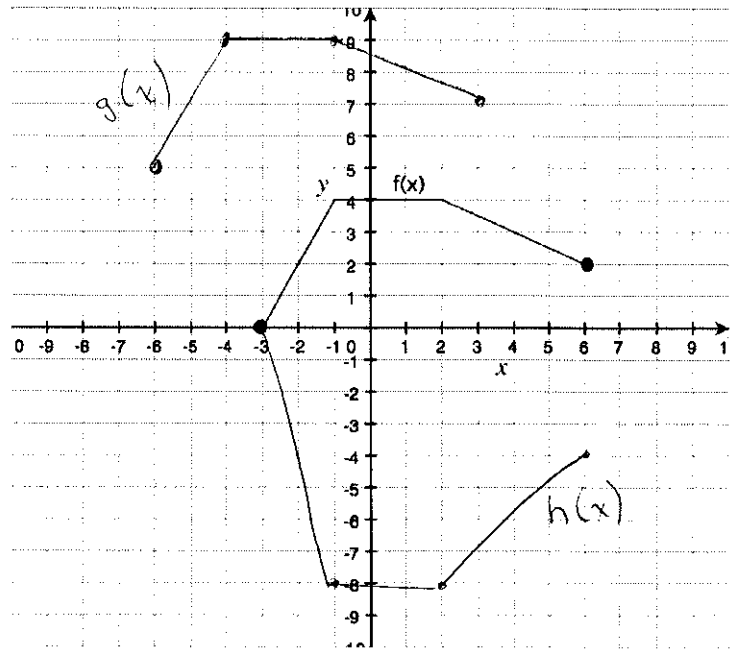
$$\boxed{b}$$

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3. Given the graph of $f(x)$, graph $g(x)$ and $h(x)$.

$$g(x) = f(x + 3) + 5$$

$$h(x) = -2f(x)$$



4. Complete the table.

Location of Point on the Original Function $y = f(x)$	Translated / Transformed Function	Type of translation / transformation (Check all that apply)	Location of Point on the Translated Function
(10, 10)	$y = f(x + 20) - 5$	<input type="checkbox"/> Vertical shift up by _____ <input checked="" type="checkbox"/> Vertical shift down by <u>5</u> <input checked="" type="checkbox"/> Horizontal shift left by <u>20</u> <input type="checkbox"/> Horizontal shift right by _____ <input type="checkbox"/> Vertical stretch by _____ <input type="checkbox"/> Vertical compression by _____ <input type="checkbox"/> Reflection over the x-axis	(-10, 5)
(-5, 6)	$y = -3f(x) - 2$	<input type="checkbox"/> Vertical shift up by _____ <input checked="" type="checkbox"/> Vertical shift down by <u>2</u> <input type="checkbox"/> Horizontal shift left by _____ <input type="checkbox"/> Horizontal shift right by _____ <input checked="" type="checkbox"/> Vertical stretch by <u>3</u> <input type="checkbox"/> Vertical compression by _____ <input type="checkbox"/> Reflection over the x-axis	(-5, 20)

5. Describe the translation of each graph from $f(x)$ to $g(x)$.

$$f(x) = x^2 \longrightarrow g(x) = (x - 12)^2 + 6 \quad \text{right 12, up 6}$$

$$f(x) = |x - 5| + 1 \longrightarrow g(x) = |x + 2| - 8 \quad \text{left 2, down 8}$$

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6. Evaluate and simplify each expression.

Let $f(x) = |3x - 1| + 5$, $g(x) = 4x + 1$, $h(x) = \begin{cases} 6, & x < 5 \\ x^2 - 10, & x \geq 5 \end{cases}$, $t(x) = x^2 - 2x$

$$f(-10) = |3(-10) - 1| + 5$$

$$f(-10) = 36$$

$$h(-2) = 6$$

$$h(5) = 5^2 - 10$$

$$h(5) = 15$$

$$f(g(-1)) =$$

$$g(-1) = 4(-1) + 1$$

$$g(-1) = -3$$

$$f(-3) = |3(-3) - 1| + 5$$

$$f(-3) = 15$$

$$g\left(f\left(\frac{2}{3}\right)\right) =$$

$$f\left(\frac{2}{3}\right) = \left|3\left(\frac{2}{3}\right) - 1\right| + 5$$

$$f\left(\frac{2}{3}\right) = 6$$

$$g(6) = 4(6) + 1$$

$$g(6) = 25$$

$$g(3-b) = 4(3-b) + 1$$

$$g(3-b) = 12 - 4b + 1$$

$$g(3-b) = 13 - 4b$$

$$f \circ g \circ h(0) =$$

$$h(0) =$$

$$g(0) = 4(0) + 1$$

$$f(1) = |3(1) - 1| + 5$$

$$f(1) = 7$$

$$g \circ t(x) =$$

$$t(x) = x^2 - 2x$$

$$g(x^2 - 2x) = 4(x^2 - 2x) + 1$$

$$g \circ t(x) = 4x^2 - 8x + 1$$

$$t(g(x)) =$$

$$g(x) = 4x + 1$$

$$t(4x + 1) = (4x + 1)^2 - 2(4x + 1)$$

$$t(4x + 1) = 16x^2 + 8x + 1 - 8x - 2$$

$$t(4x + 1) = 16x^2 - 1$$

7. Evaluate and simplify each expression.

f:

x	5	-5	3	8	0	1	9
y	12	10	-1	3	0	-5	7

g:

x	-3	2	8	1	-4	7	6
y	0	-5	-5	8	1	3	5

$$f(5) = 12$$

$$g(1) = 8$$

$$f(-5) - g(2) = 10 - 5$$

$$f(-5) - g(2) = 15$$

$$f(1)g(1) = (-5)(8)$$

$$f(1)g(1) = -40$$

$$[f(9) + g(8)]^{f(8)} =$$

$$[7 + -5]^3 = 8$$

$$f(g(8)) =$$

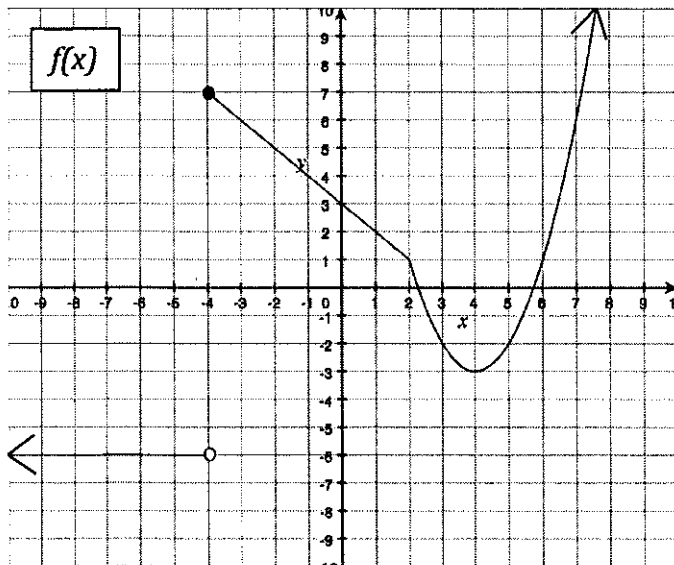
$$f(-5) = 10$$

$$g(f(9)) =$$

$$g(7) = 3$$

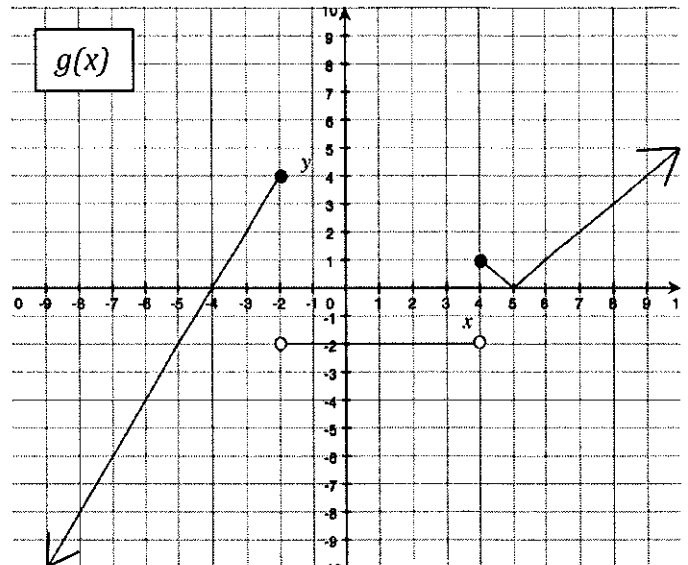
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8. Evaluate each expression.



$$f(-4) = 7$$

$$f(4) = -3$$



$$g(-2) = 4$$

$$f(-20) = -6$$

$$f(g(1.5)) = 5$$

$$g(f(4)) = 2$$

$$f(g(4)) = 2$$

$$(f + g)(7) = 6 + 2$$

$$(f \cdot g)(7) = 8$$

9.

Let $f(x) = 3 - 2x$, $g(x) = x^2 - 5x + 2$, $h(x) = 3x - 5$.

Find each of the following, and simplify.

$$1) (g + f)(x) = x^2 + 5x + 2 + 3 - 2x$$

$$(g + f)(x) = x^2 + 3x + 5$$

$$2) 3f(x) - g(x) = 3(3 - 2x) - (x^2 - 5x + 2)$$

$$3f(x) - g(x) = 9 - 6x - x^2 + 5x - 2$$

$$3f(x) - g(x) = -x^2 - x + 7$$

$$3) (f \times g)(x) = (3 - 2x)(x^2 - 5x + 2)$$

$$(f \times g)(x) = 3x^2 - 15x + 6 - 2x^3 + 10x^2 - 4x$$

$$(f \times g)(x) = -2x^3 + 13x^2 - 19x + 6$$

$$4) (f \circ g)(x) = 3 - 2(x^2 - 5x + 2)$$

$$(f \circ g)(x) = 3 - 2x^2 + 10x - 4$$

$$(f \circ g)(x) = -2x^2 + 10x - 1$$

$$5) [h(x)]^2 = (3x - 5)(3x - 5)$$

$$[h(x)]^2 = 9x^2 - 30x + 25$$

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Part 3: Graphical Analysis

1) What is the domain of $f(x)$?

$$[-5, \infty)$$

2) What is the range of $f(x)$?

$$[-4, \infty)$$

3) For what values of x does $f(x) = 0$?

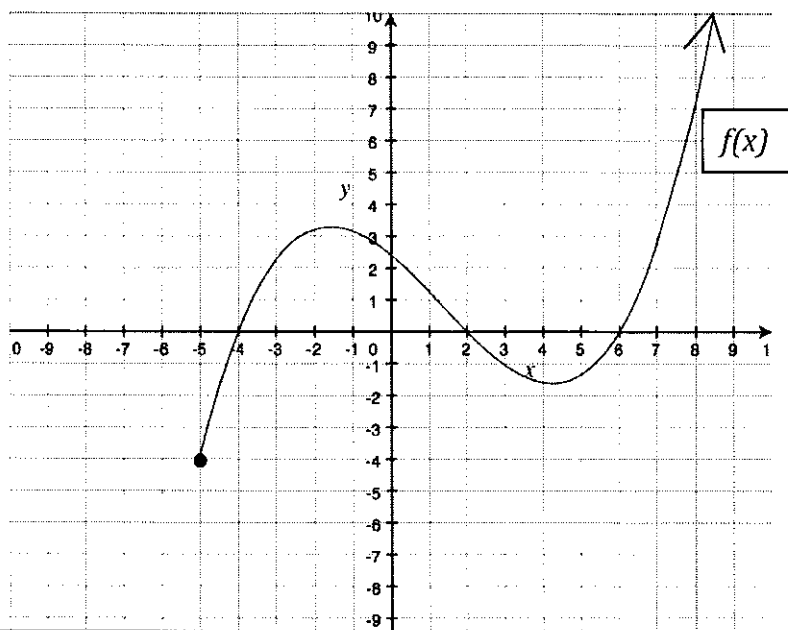
$$-4, 2, 6$$

4) What is the value of $f(x)$ when $x = 0$?

$$3$$

5) Over what intervals is $f(x) \geq 0$?

$$[-4, 2] \cup [6, \infty)$$



6) What is the domain of $g(x)$?

$$(-\infty, 3]$$

7) What is the range of $g(x)$?

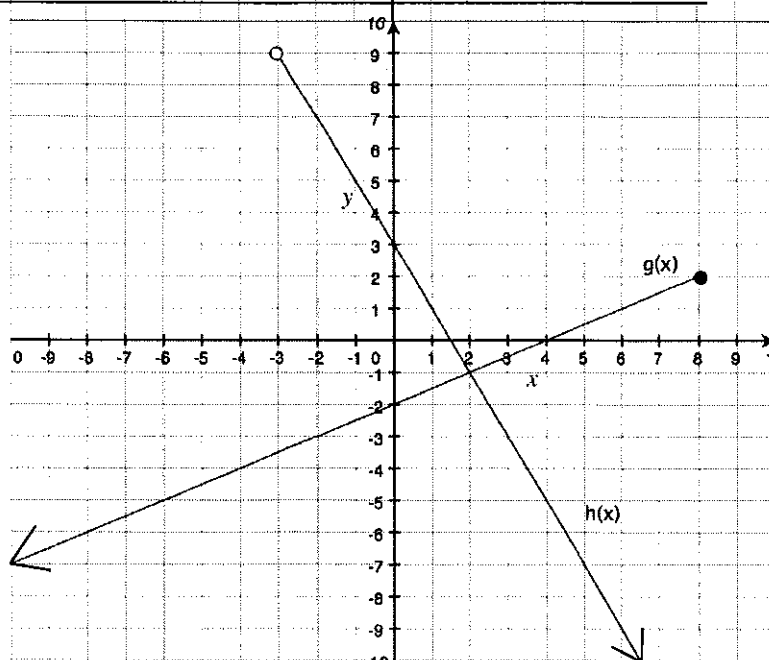
$$(-\infty, 2]$$

8) What is the domain of $h(x)$?

$$(3, \infty)$$

9) What is the range of $h(x)$?

$$(-\infty, 4)$$



10) $(h - g)(-2) = 7 - 3 = 4$

11) $(h \times g)(2) = (-1)(2) = -2$

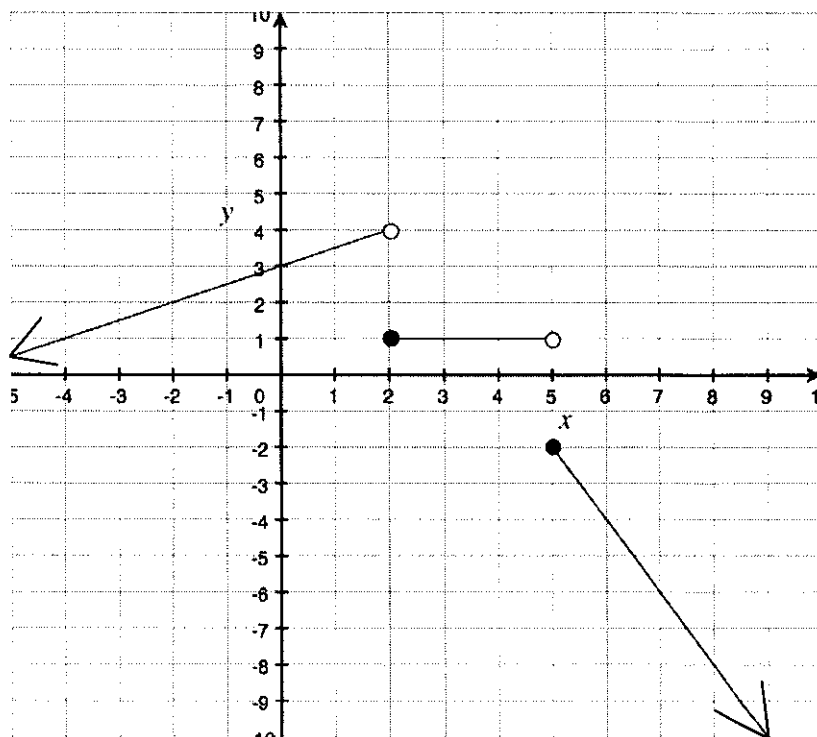
12) $|h(5)| = |-7| = 7$ 13) $(h \circ g)(8) = h(2) = -1$

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Part 4: Piecewise Functions

Write the piecewise function $f(x)$ that would produce the following graph: **(6 points)**

$$f(x) = \begin{cases} \frac{1}{2}x + 3 & \text{if } x < 2 \\ 1 & \text{if } 2 \leq x < 5 \\ -2x + 8 & \text{if } x \geq 5 \end{cases}$$



Graph $f(x)$ on the coordinate plane. **(6 points)** Then, find **exact** answers for the evaluation problems that follow. **(1 point each)**

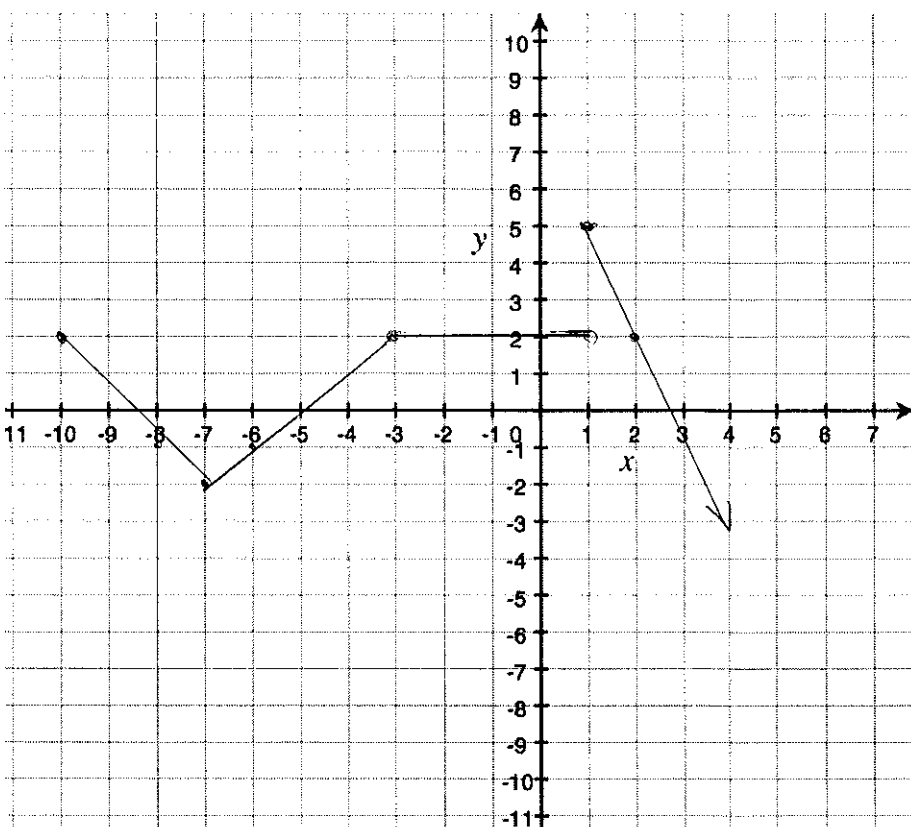
$$f(x) = \begin{cases} |x + 7| - 2, & -10 \leq x < -3 \\ 2, & -3 \leq x < 1 \\ -3x + 8, & x \geq 1 \end{cases}$$

$$f(-7) =$$

$$f(-2.65) =$$

$$f(1) =$$

$$f\left(\frac{5}{3}\right) =$$



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9. Determine whether the two functions are inverses. State how you know.

$$f(x) = x^2 - 5$$

$$g(x) = \sqrt{x} + 5$$

$$f(x) = x^2 - 5$$

$$y = x^2 - 5$$

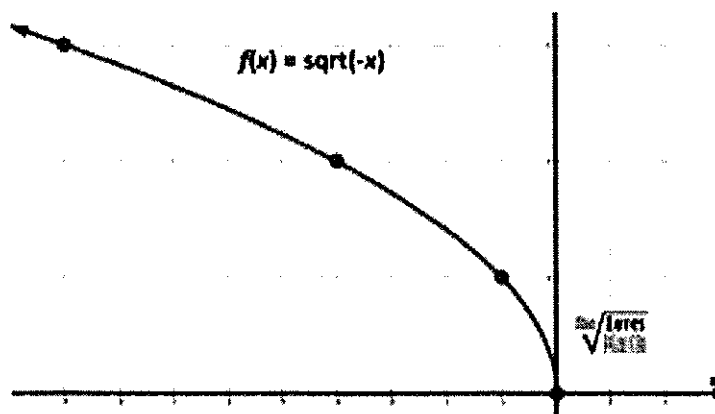
$$x = y^2 - 5$$

$$x + 5 = y^2$$

$$\sqrt{x + 5} = y$$

The functions are not inverses because the point (x, y) does not map to (y, x) .

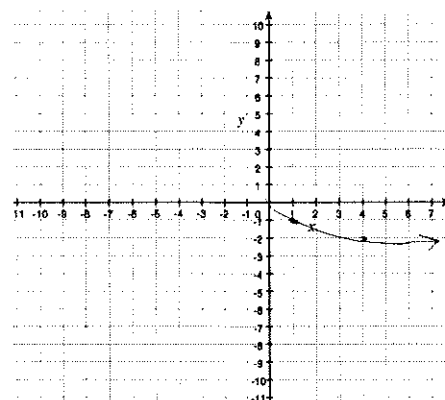
10. Use the following graph to answer the questions.



Domain: $(-\infty, 0]$ **Range:** $[0, \infty)$

a) Draw $f(x)$ rotated 180° about the origin, and state the equation of the transformed function.

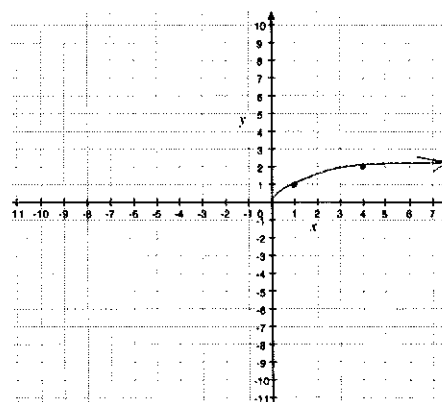
$$f(x) = -\sqrt{x}$$



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b) Draw $f(x)$ reflected across the y -axis, and state the equation of the transformed function.

$$y = \sqrt{x}$$



c) Draw $f(x)$ reflected across the x -axis, and state the equation of the transformed function

$$y = -\sqrt{x}$$

